



TEXTILE FINISHING PROCESS

New Process Increases Productivity and Energy Efficiency in Fabric Finishing

Benefits

- ◆ Through 2000, the cumulative energy savings have been over 45 billion Btu
- ◆ Through 2000, the cumulative reduction in NO_x emissions have been 7 tons and the cumulative CO₂ reduction has been 2790 tons
- ◆ Lower energy consumption (over 60% reduction per unit weight of fabric)
- ◆ Reduced emissions (over 60% reduction in emissions)
- ◆ Higher production speeds resulting in greater productivity (over 100% increase in production capability)

Applications

This new fabric finishing process will apply to the textile finishing industry in the United States and help the industry improve its efficiency and competitiveness in the global textile market.

The U.S. textile industry consumes large amounts of energy and water in finishing fabrics. The finishing operation is the final step in producing fabrics and typically imparts the aesthetic and physical properties required for various fabric uses. These properties, achieved through a combination of chemical and mechanical processes, include shrinkage control, stain resistance, water repellency, and softness.



Foam Finishing Applicator at Brittany Dyeing and Printing Corporation Improves Fabric Finishing System





NICE³

Success Story

Using conventional technology, fabric finishers immerse fabric in a solution of finishing chemicals diluted in water. Once saturated, the fabric is removed and excess moisture is squeezed out mechanically. The moisture is further reduced by a vacuum system before the fabric is directed to fabric drying equipment called the “tenter frame.” The tenter frame removes the remaining moisture by processing the fabric through a series of nozzles that expose it to hot air. Because of the relatively high moisture content, the fabric finishing process has been very energy intensive.

Textile finishers now have another alternative. A partnership program has developed a more efficient and productive finishing system. The partners in this effort include Brittany Dyeing and Printing Corporation, a fabric finishing and printing firm, Commonwealth Electric Company, the Massachusetts Executive Office of Environmental Affairs’ Office of Technical Assistance for Toxic Use Reduction, and the U.S. Department of Energy’s (DOE’s) NICE³ (National Industrial Competitiveness through Energy, Environment, and Economics) Program. In 1996 Brittany was awarded a \$425,000 grant under the NICE³ Program to modify its finishing operation to increase energy efficiency, reduce waste, and improve productivity. Brittany combined the NICE³ grant with its own investment of more than \$750,000 to develop and demonstrate the new fabric finishing system.

Technology Description

In contrast to the traditional process, the new finishing equipment applies the finish chemicals to the fabric in a “foam” media rather than a liquid. This foam finishing is applied by passing the fabric over a specially designed foam applicator. The application allows for consistent foam application and reduced moisture content because air, not water, is used as the dilutant. With the new process, the moisture content averages between 20% to 25% compared with 40% to 60% for the conventional process. The reduced moisture content has the added benefit of dramatically increasing the speed at which the fabric is finished.

“With the help of the NICE³ grant, we have been able to develop and prove that this new process is technically viable, energy efficient, and environmentally friendly. Furthermore, the process dramatically increases productivity, which helps level the playing field when competing with imported fabrics.”

**—Bob Cruise
Vice President of Operations
Brittany Dyeing and
Printing Corporation**



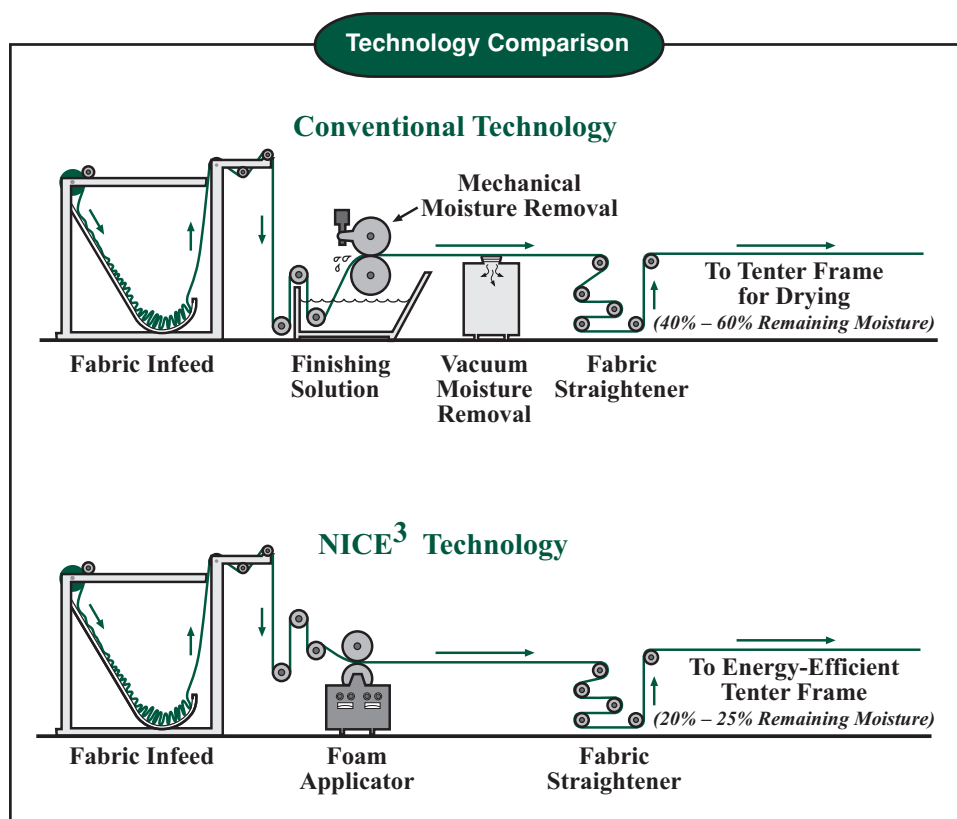
OFFICE OF INDUSTRIAL TECHNOLOGIES

ENERGY EFFICIENCY AND
RENEWABLE ENERGY
U.S. DEPARTMENT OF ENERGY



Project Partners

- ◆ Brittany Dyeing and Printing Corporation
New Bedford, MA
- ◆ Commonwealth Electric Company
Wareham, MA
- ◆ Massachusetts Executive Office of Environmental Affairs' Office of Technical Assistance for Toxic Use Reduction
Boston, MA



In addition to the foam finishing process, this project included the installation of a new tenter frame. This new tenter frame uses high-efficiency natural gas burners, a more efficient air distribution system, and smaller high-efficiency electric motors. The new tenter frame also employs a unique chain-and-rail design capable of better fabric gripping, particularly at high production speeds. The benefits of this new design, coupled with the decreased moisture content of the fabric, allows for increased production of finished fabric from 120 yards per minute to 275 yards per minute. While foam finishing of fabric is not a new technology, it has not been used at such high production speeds.





Energy Savings and Pollution Prevention

The resource savings and pollution prevention from the fabric finishing process result from reduced natural gas and electricity use per unit fabric finished, as well as significantly reduced water use. Actual savings were derived from natural gas and electric metering done at Brittany and are shown in the following table.

Natural Gas and Electric Savings from the Fabric Finishing Process

Resource	Conventional Technology	NICE ³ Technology	Savings	Percent Savings
Natural Gas (<i>Btu/year</i>)	2.04×10^{10}	7.13×10^9	1.33×10^{10}	65%
Electricity* (<i>Btu/year</i>)	1.54×10^{10}	5.93×10^9	9.47×10^9	61%
Water (<i>gallons/year</i>)	1.15×10^6	2.25×10^5	9.25×10^5	80%

*Electricity converted at 10,500 Btu/kWh.

Total energy savings per installed unit, assuming 250 days of operation per year and 3 shifts per day, are estimated to be 22.7 billion Btu per year. The yearly estimated environmental savings are 1380 tons of CO₂, 6.4 tons of SO_x, 3.8 tons of NO_x, and 1.9 tons of particulate.

The cost savings associated with this technology include the energy savings, the water and wastewater savings, and the productivity increase. Brittany estimates that the annual energy and associated water savings alone have saved the company more than \$140,000 compared with conventional technology.

NICE³ PROGRAM

NICE³ – National Industrial Competitiveness through Energy, Environment, and Economics: An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to \$400,000. Grants fund up to 50% of total project cost for up to 3 years.

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